

REMARKS/ARGUMENTS

Applicants respectfully request reconsideration of the above-identified application.

With the present amendment and response, Applicants have corrected several typographical errors in the specification. Original text is identified by parentheses (""), while the amended language is identified by dashes (-- --). On page 7 at line 24, the word "uinder" has been changed to --under--. At line 26 on page 9, the word "strait" is now --straight--. Finally, on page 12 at line 5, the word --irradiation-- replaces the misspelled "irradiatio". Applicants also have amended claims 3, 5, 7, 11, and 16 to delete the term "hard". Responsive to the Examiner's request, Applicants have included copies of the references mentioned on pages 1-4 of the specification.

Looking to the claim rejections, claims 3, 5, 7, 11, and 16 stand rejected under 35 U.S.C. §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, the Examiner states that the term "hard" as used in the context of "hard x-ray output" is not understood as the specification does not disclose what is meant by such a limitation. Responsive to the Examiner's rejection, Applicants have deleted the term "hard" from claims 3, 5, 7, 11, and 16.

Claims 1-5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted state of the art in view of U.S. Patent No. 6,628,750 filed November 9, 2000 and issued September 30, 2003 to Korenev (hereinafter, "Korenev"). The Examiner cites Korenev as teaching that "any type of linear accelerator can be used as a source of electrons" and "using multiple radiation energy levels (equivalent to multi channel) output from a single electron accelerator". Office action at page 4 (citations omitted).

The present inventive method provides a multi-channel linear induction acceleration system (MLIA) which generates one or more electron beams in order to irradiate a given object. Use of the MLIA is particularly advantageous when used to generate a plurality of electron beams of the same intensity to irradiate different portions of the object simultaneously. This enables the user to increase the quantity of the object irradiated in a given period of time. When compared to other electronic sterilizer sources, the MLIA produces a lower intensity external electric field, which provides for a safer work environment, and enables the method to be practiced in a greater number of industrial applications.

In order to appreciate the structural differences and advantages of the present invention over the prior art, it is necessary to distinguish the different electronic sterilizer sources available. As the Examiner notes, Applicants' specification discloses that certain electronic sterilizers in the prior art use an linear induction accelerator (LIA) to provide an electron beam

source. An LIA achieves acceleration of electrons by the action of a longitudinal vortex electron field having relatively low frequency. Special inductors in the working acceleration channel generate this field.

A particular disadvantage of an LIA is the generation of a significantly strong vortex external field generated in the space surrounding the LIA. Such a strong external electric field has a negative impact on both the personnel working in the vicinity of the LIA and the object to be irradiated, resulting in a "dead zone" around the device. Overcoming this deficiency requires that protective screening be provided to protect attending personnel working near the LIA. Additionally, the LIA and certain objects to be treated must be spaced apart a distance at which the intensity of the external electric field decreases to acceptable values. This distance is necessary because exposure to a strong electric field is forbidden for certain objects. For example, such exposure may change the nutritional characteristics of food, or, worse, exposure may destroy the object being irradiated. As noted in the specification, for an LIA producing an electron beam of 18 MeV the separation distance is approximately 20 meters. As a consequence of these electromagnetic compatibility issues, LIAs are excessively large and may not be acceptable for irradiation of certain objects.

Another limitation of the LIA device is its output. An LIA-based electron sterilizer has only one limited width and limited current strength electron beam. Using a single beam of limited width and strength means a greater time is required to fully irradiate the entire surface area of an object resulting in lower productivity.

Another electronic sterilizer source used in the prior art is the RF-type accelerator. Such a device utilizes microwave generators to accelerate the electrons. Such generators are expensive to produce and operate. Additionally, as with LIAs as described above, microwave generators have a negative impact on the work environment and certain food and pharmaceutical products. Also like an LIA, the result of an RF-type accelerator is a single electron beam.

Korenev, cited by the Examiner, discloses an RF-type accelerator. Accelerator 10 accelerates the electrons and discharges them through a plurality of ports. It should be noted that while each port discharges electrons of a particular energy, the accelerator generates electrons at only one port at a time. Korenev at Col. 2, lines 63-64. The single selected beam then is directed to a beam splitter, each resulting beam being directed to a scanner horn which cause the beam to be scanned across either the upper or lower surface of the object. Korenev at Col. 2, lines 44-49 and Col. 4, lines 44-56. Which electron beam is selected, i.e., which port

discharges an electron beam, depends on the characteristics of the object to be irradiated. Thus, the output of this sterilizer at a given time is a single electron beam of a particular energy.

Looking to claim 1, none of the references disclose a "multi-channel linear acceleration system." The Examiner argues that combining an LIA with the teachings of Korenev would provide an accelerator "equivalent" to an MLIA. This simply is not the case. Initially, Applicants would note that there is no teaching or suggestion to combine an LIA and an RF-type device. These are separate and distinct devices that operate on completely difference principles. As noted above, an LIA uses special inductors to generate a longitudinal vortex electron field having relatively low frequency. An RF accelerator utilizes microwave generators to accelerate electrons. Picking and choosing features from two such disparate devices clearly is hindsight reconstruction of the claimed invention.

Even assuming, *arguendo*, that the combination is proper, the resulting device would not be equivalent to an MLIA. As described in detail above, both LIAs and RF-type accelerators generate unwanted electro- or magnetic fields that are detrimental to both objects to be irradiated and workers who must operate in the vicinity of the devices. By comparison, in an MLIA the acceleration channels of any two neighboring linear acceleration blocks are directed reciprocally opposite to one another. Owing to this, the external electric fields generated by each acceleration block effectively cancel each other out and, thus, produce a much smaller external electric field, which is safer for workers, eliminates the "dead zone" associated with LIAs, and allows the MLIA to be used in a broader range of applications. An MLIA also provides increased acceleration rates of the separate linear accelerators. Finally, the MLIA may operate in a trigger mode wherein one part of the acceleration block accelerates the beams, while the other part "rests." This enables the magnetic cores therein to remagnetize. An MLIA is structurally different from an LIA, an RF-type accelerator, or the combination thereof; it performs in a different way and achieves a different result.

The Examiner states that Korenev teaches that "any type of linear accelerator can be used as a source of electrons (col. 5, lines 60-62)". Office action at pages 4-5. What that portion of Korenev actually says is that, "In an alternative embodiment, there are as many accelerators as scan horns or scan horn pairs. Linear accelerators of the same or different energy are contemplated." This language clearly does not indicate that any type of linear accelerator may be used.

Claims 2 and 3, dependent on claim 1, should be considered patentable for the reasons given above.

Claim 4, dependent on claim 1, additionally recites that the MLIA is provided having "more than one channel, each providing a channel-designated discrete said output" and "step (c) manipulates each said channel designated output by magnetically causing it to sweep across said treatment region associated with said channel-designated output." As noted above, use of the MLIA is particularly advantageous when used to generate a plurality of electron beams of the same intensity to irradiate different portions of the object simultaneously. See Figs. 3-6 of the present application. This enables the user to increase the quantity of the object irradiated in a given period of time. This multiplicity of spatially separated beams enables an object to be treated more quickly, which increases system productivity. None of the references, either alone or in combination use a plurality of beams simultaneously to treat a single object.

Although the Examiner cites Korenev as "using multiple radiation energy levels," Korenev's electron beams are used sequentially not simultaneously. The advantage of Korenev's device is that a particular energy electron beam may be selected for a particular object or product to be irradiated. As noted above, however, a rotary accelerator only discharges an electron beam from a single port at any given time.

Claim 5, dependent on claim 4, should be considered patentable for the reasons given above in connection with claims 1 and 4.

Claims 6, 7, 10-12, and 15-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted prior art in view of Korenev and in further view of U.S. Patent No. 5,357,291 issued October 18, 1994 to Schonberg, et al. (hereinafter, "Schonberg").

Claim 6, like claim 4, recites a multi-channel linear induction accelerator having "more than one channel, each providing a channel-designated discrete said output". Claim 6 further recites that "said step (c) manipulates each said channel-designated output by defocusing it to derive an expanded channel-designated output at said treatment region in a manner wherein said channel-designated outputs of adjacent said channels are caused to overlap and mutually extend over said treatment region." This feature of the invention is illustrated in Figs. 4-6 and the corresponding descriptions thereof in the specification.

Schonberg describes a system utilizing a pulsed linear electron accelerator, the electrons being accelerated by energy generated by a microwave source such as a magnetron. Col. 3 lines 38-49. A conventional linear induction accelerator also may be used, although Schonberg admits that these devices have been used in the laboratory with only limited success. Col. 3, lines 55-60. The output of the accelerator is a single electron beam as shown in Figs. 3 and 4. Means may be provided to defocus the electron beam onto a window, 30, which separates the accelerator from the reaction chamber 32.

As noted above, none of the references, including Schonberg disclose an MLIA. Schonberg also does not disclose an accelerator having more than one channel for producing more than one electron beam. Finally, Schonberg does not disclose defocusing more than one electron beam in a manner where the defocused beams overlap and mutually extend over the treatment region.

Claim 7, 10-12, and 15-17 should be considered patentable for the reasons given in connection with claims 1 and 6.

Claims 8-9, 13-14 and 18-19 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the admitted prior art in view of Korenev and Schonberg and in further view of U.S. Patent No. 4,704,565 issued November 3, 1987 to Blacker, Jr. et al. (hereinafter, "Blacker").

Blacker's device is in the field of electron gun systems for television receiver cathode ray tubes. In such devices, three outputs are converged to a single spot on a target surface, i.e., a television screen. Blacker Col. 1, lines 66-68. Resolution of the television is determined by the size and symmetry of the converged beam spots. Blacker, Col. 1, lines 36-40 and 57-59. By contrast, the present inventive method involves azimuthally-symmetrically (claims 8, 13 and 18) or azimuthally-asymmetrically (claims 9, 14, and 19) defocusing one or more outputs from an MLIA to irradiate or otherwise treat a larger area of the target surface. See, for example, Figs. 4 and 6 of the present application. Blacker is thus in a different art field addressing a different problem with a different solution.

In view of the foregoing remarks, wherein the claim program is seen to readily distinguish over the references, Applicants earnestly solicit issuance of a Notice of Allowance.

Respectfully submitted,

Date: July 25, 2005

Diane E. Burke

Diane E. Burke
Reg. No. 45,725
MUELLER AND SMITH, L.P.A.
Mueller-Smith Building
7700 Rivers Edge Drive
Columbus, Ohio 43235-1355
Tel.: 614-436-0600
Fax: 614-436-0057
email: dburke@muellersmith.com

Appln. No. 10/022,288
Amendment dated July 25, 2005
Reply to Office Action of May 5, 2005



CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited on July 25th, 2005 with the United States Postal Service as first class mail in an envelope addressed to:

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450


Jane Keeney